AERONAUTICAL CHARTING FORUM
Instrument Procedures Group
April 29-30, 2002
HISTORY RECORD

FAA Control # 02-01-243

Subject: Holding Pattern Definition

Background/Discussion: The current FAA Order 7130.3, *Holding Pattern Criteria*, specifies the length of the holding pattern to be the length of the outbound leg. This works well for the purposes of procedure construction to specify the size of the holding pattern airspace to be protected. However, it does not help the pilot to determine when he/she is at the end of the outbound leg when it is a distance from where the outbound leg began.

There are four potential ways to measure a holding pattern:

1. Length of the outbound leg - Pilots have no way of being able to determine from current cockpit instrumentation when they are at that location.

2. Length of the inbound leg - This is the current method of determining holding pattern size for holds that have timing. The pilot, according to the AIM, is supposed to adjust the length of the outbound leg so as to have the inbound leg at the specified time. This is not very effective because it takes about two or three turns in the holding pattern to finally get it close to the correct timing.

3. Distance in which the holding pattern is to be completed. This is the way pilots determine the distance for completing procedure turns. This method is OK but can lead to turns outside protected airspace when strong winds occur. It is not very precise.

4. Distance from the holding fix to the point where the outbound leg is terminated. This is the only means that current GPS avionics can measure where they are.

Recommendation: Do not change 7130.3 alone since it is a good way for procedure specialists to define holds that keep the aircraft within protected airspace. However, recommend that the AIM and other appropriate publications specify that pilots determine the point where they complete the outbound leg by using their GPS avionics. When the GPS displays the appropriate distance (typically 4 NM) when flying the outbound leg of the holding pattern, that is the point where they turn back inbound to the holding fix.

Comments: This recommendation affects the AIM and AIP.

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INITIAL DISCUSSION (Meeting 02-01): New issue presented by Jim Terpstra, Jeppesen regarding holding pattern definition for RNAV holding. Jim recommends that AIM guidance similar to that provided for DME holding (see AIM figures 5-3-5 and 5-3-6) be provided for RNAV/GPS holding. The group consensus was favorable. Norm LeFevre agreed to coordinate the issue with AFS-410 and make AIM revisions accordingly. ACTION: AFS-420.

MEETING 02-02: Tom Schneider, AFS-420, briefed that Flight Standards agrees with the consensus reached at the last ACF. Tom circulated a proposed AIM change, prepared by Steve Jackson, AFS-420, which will be forwarded for publication in AIM Change 3, effective August 7, 2003. The change will revise paragraph 5-3-7j5 as well as the note below Figure 5-3-5 to reflect that GPS and DME holding procedures are identical. The issue will remain open pending AIM publication. ACTION: AFS-420.

MEETING 03-01: Tom Schneider, AFS-420, briefed that all work has been complete and the change submitted for AIM publication in Change 3 on the August 7 effective date. The change will revise paragraph 5-3-7j5 as well as the note below Figure 5-3-5 to reflect that GPS and DME holding procedures are identical. The issue will remain open pending AIM publication. ACTION: AFS-420.

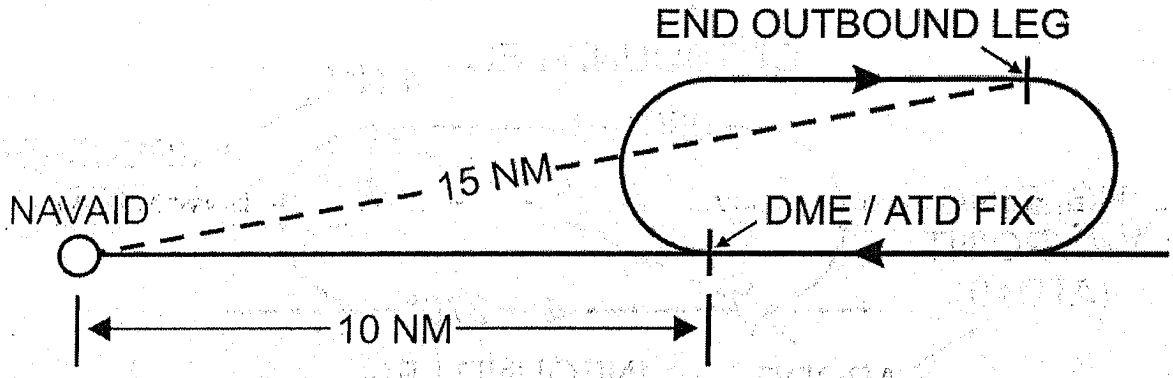
MEETING 03-02: Bill Hammett, AFS-420 (ISI) briefed that the August 7 issue of the AIM was revised to include RNAV holding examples. However, post-publication review indicates that while the text is satisfactory, Figures 5-3-5 and 5-3-6 are incorrect in depicting RNAV (GPS) holding. AFS-420 has initiated action to have the figures corrected. Steve Bergner noted that some FMS systems calculate the total distance around the holding pattern, vice using an ATD to determine the outbound leg termination point. Bill responded that the examples were generic to explain manual pilot-controlled holding patterns. ACTION: AFS-420.

MEETING 04-01: Tom Schneider, AFS-420, presented the AIM submissions that will be published in August. All agree that the submission adequately addresses the original issue, regarding RNAV holding. However, Steve Bergner, NBAA, noted that some FMS' provide positive course guidance (PCG) throughout the holding pattern and do not use along track distance (ATD) to specify the end of the outbound leg. He recommended a clarification note to the proposed AIM material. Tom agreed to take this comment back to AFS-420. Paul Ewing, ATP-500 (AMTI) noted that "ATD" was an incorrect acronym for along track distance. The pilot/controller glossary specifies "LTD"; "ATD" is used for Air Traffic Division. Tom noted that "ATD" has been used in the TERPS arena since the advent of RNAV and Brad Rush, AVN-101, pointed out that "ATD" is published on approach charts. No one, other than air traffic representatives was aware of the use of "LTD". Tom will also take this comment back to AFS-420 for staffing. A copy of the AIM submission is included below. ACTION: AFS-420.

Change AIM Paragraph 5-3-7, j, 5 (AIP paragraph ENR 1.5, 1.3.2.4) to read:

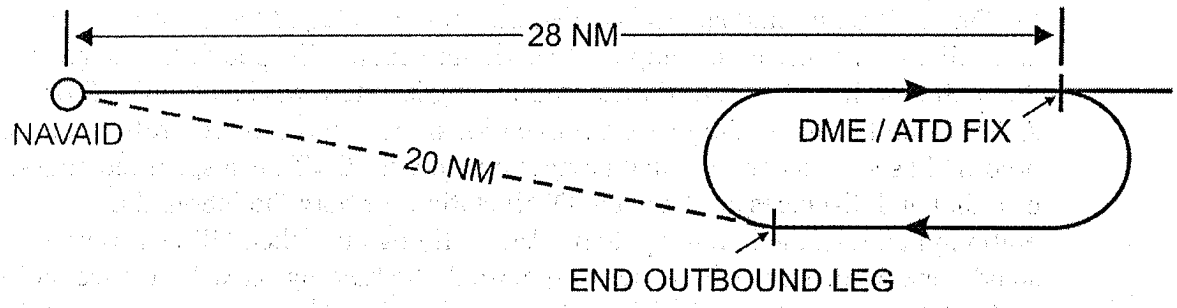
5. Distance Measuring Equipment (DME)/GPS Along Track Distance (ATD). DME/GPS holding is subject to the same entry and holding procedures except that distances (nautical miles) are used in lieu of time values. The outbound course of the DME/GPS holding pattern is called the outbound leg of the pattern. The controller or the instrument approach procedure chart will specify the length of the outbound leg. The end of the outbound leg is determined by the DME or ATD readout. The holding fix on conventional procedures, or controller defined holding based on a conventional navigation aid with DME, is a specified course or radial and distances are from the DME station for both the inbound and outbound ends of the holding pattern. When flying published GPS overlay or standalone procedures with distance specified, the holding fix will be a waypoint in the database and the end of the outbound leg will be determined by the ATD. Some GPS overlay and early stand alone procedures may have timing specified. (See FIG 5-3-5, FIG 5-3-6 and FIG 5-3-7) See paragraph 1-1-20, Global Positioning System (GPS), for requirements and restriction on using GPS for IFR operations.

FIG 5-3-5 (ENR 1.5-4)
Inbound Toward NAVAID



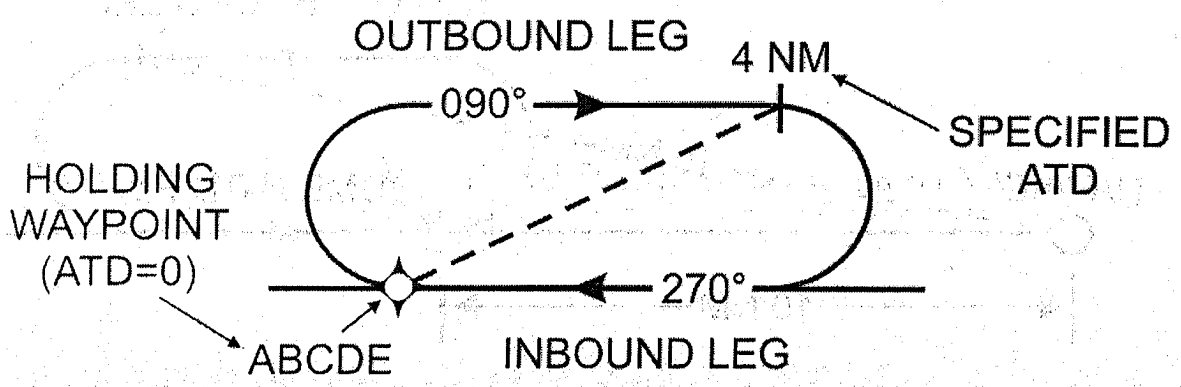
Note-
When the inbound course is toward the NAVAID, the fix distance is 10 NM, and the leg length is 5 NM; then the end of the outbound leg will be reached when the DME/ATD reads 15 NM.

FIG 5-3-6 (ENR 1.5-5)
Inbound leg Away from NAVAID



Note-
When the inbound course is away from the NAVAID and the fix distance is 28 NM, and the leg length is 8 NM, then the end of the outbound leg will be reached when the DME/ATD reads 20 NM.

New FIG 5-3-7 (ENR 1.5-6)
GPS/RNAV Holding



NOTE-
The inbound course is always toward the waypoint and the ATD is zero at the waypoint. The ~~outbound~~ end of the ~~holding pattern~~ outbound leg is reached when the ATD reads the specified distance.

Explanation of change: Clarifies holding using GPS/RNAV under different circumstances.

MEETING 04-02: Bill Hammett, AFS-420 (ISI), briefed that the revised holding pattern depictions have been included in the AIM as Figures 5-3-5, 5-3-6, and 5-3-7. The NBAA comments at the last ACF-IPG were discussed within AFS-420 and it is not believed that another figure depicting advanced FMS holding is warranted. Information for these systems is included in the avionics operating manual. The AIM contains basic information and is adequate as published. This portion of the issue is closed

Regarding the acronym for "along-track-distance'; research indicates that "ATD" has been the established acronym since the concept was first initiated. This is reflected in all RNAV-related technical documents including FAA 8260-series criteria and policy orders, charting specifications, as well as the AIM Appendix 3. The Pilot/Controller Glossary is in error and should be revised to reflect agreement with other publications. AFS-420 will forward a memorandum to Air Traffic to have the PCG reflect ATD as the appropriate acronym. ACTION: AFS-420.

MEETING 05-01: Since the last meeting, Bill Hammett, AFS-420 (ISI), has coordinated with Martin Heller, Airspace and Procedures Branch under ATO-T, who is OPR for the pilot/controller glossary (PCG). The acronym for along-track distance will be changed to "ATD" in the February 16, 2006 update to the PCG. The new definition will read (changes in bold text): "ALONG**-**TRACK DISTANCE (**A**TD) - The measured distance along the designed flight path from a point-in-space by systems using area navigation reference capabilities that are not subject to slant range errors". The issue is closed for further discussion and will be tracked until published. ACTION: None required – open, pending publication.

MEETING 05-02: Bill Hammett, AFS-420 (ISI), coordinated with the OPR for the Pilot Controller Glossary (PCG) prior to the meeting. The "ATD" acronym for along-track distance is still on track to be published in the February 16, 2006 update to the PCG. ACTION: None required – open, pending publication.

MEETING 06-01: Bill Hammett, AFS-420 (ISI), briefed that the "ATD" acronym for along-track distance was published in the February 16, 2006 update to the Pilot Controller Glossary. ITEM CLOSED.
